



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/584,878	08/29/2006	John McNeil	7762-0001WOUS	7907
35301 7590 01/21/2009 MCCORMICK, PAULDING & HUBER LLP CITY PLACE II 185 ASYLUM STREET HARTFORD, CT 06103				
EXAMINER HAWKINS, KARLA				
ART UNIT		PAPER NUMBER		
1797				
MAIL DATE		DELIVERY MODE		
01/21/2009		PAPER		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

### Office Action Summary

**Application No.**

10/584,878

**Applicant(s)**

MCNEIL ET AL.

**Examiner**

KARLA HAWKINS

**Art Unit**

1797

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 29 June 2006.  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-51 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-51 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 29 June 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☒ Information Disclosure Statement(s) (PTO/CI/CC)  
Paper No(s)/Mail Date 6/29/06  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_  
5) ☐ Notice of Informal Patent Application  
6) ☐ Other: \_\_\_\_\_

### DETAILED ACTION

1. This is the initial Office action for application 10/584,878.
2. Claims 1-51 are pending.

#### ***Claim Rejections - 35 USC § 102***

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1 and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by

**TRIMMER ET AL. (US 5,202,023).**

5. With regard to claims 1 and 28 **TRIMMER** discloses a fluid *separation module* (abstract), comprising a *plurality of hollow fiber membranes* (col. 2, lines 58-59); one or more fluids where the fluids have different rates through or across the membrane, the fluids can be in the gas, vapor or liquid form. The mixture of gases to be separated preferably comprises *oxygen and nitrogen* (col. 7, lines 31-38). **TRIMMER** also discloses a hollow *core* (col. 17, line 1), and in the separation of oxygen from nitrogen a *pressure differential is between 5 psi and 250 psi* (col. 16, lines 13-19); and a tubesheet comprising a thermoplastic polymeric material (col. 2, lines 63-64).

#### ***Claim Rejections - 35 USC § 103***

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148

USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. Claims 31, 32 and 51 are rejected under 35 U.S.C. 103(b) as being obvious by

**TRIMMER ET AL. (US 5,202,023)** in view of **LYONS ET AL. (US 2004/014912)**.

9. With regard to claims, 31, 32, and 51 **TRIMMER** discloses a fluid *separation module* (abstract), comprising a *plurality of hollow fiber membranes* (col. 2, lines 58-59); one or more fluids where the fluids have different rates through or across the membrane, the fluids can be in the gas, vapor or liquid form. The mixture of gases to be separated preferably comprises *oxygen and nitrogen* (col. 7, lines 31-38). **TRIMMER** also discloses a hollow *core* (col. 17, line 1), and in the separation of oxygen from nitrogen a *pressure differential is between 5 psi and 250 psi* (col. 16, lines 13-19); and a tubesheet comprising a thermoplastic polymeric material (col. 2, lines 63-64).
10. With further regard to claims 31 and 51 **TRIMMER** does not appear to explicitly disclose a modification technique so as to increase the number of pores.

11. However, **LYONS** discloses a modification technique that increases the number of pores (paragraph 19), and the modified fiber can have up to twice as many pores as conventional fiber (paragraph 20).

\***TRIMMER** and **LYONS** are analogous art because they are from the *same field of endeavor* of gas and fluid separation processes and devices.

12. At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the separation module of **TRIMMER** to include the modification technique of **LYONS**.

13. The motivation would have been to provide a composite hollow fiber gas separation membrane that is not only permeable to produce enriched oxygen air, but also to make it more energy efficient so that it can operate at low differential pressures (**LYONS**; paragraph 12).

14. Therefore, the invention as a whole would have been *prima facie* obvious to one of ordinary skill in the art at the time the invention was made.

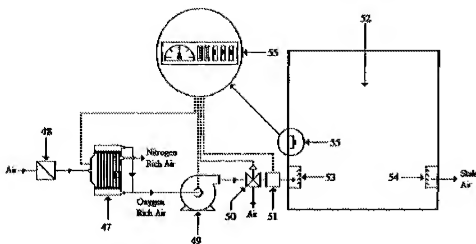
15. With even further regard to claim 51, **TRIMMER** teaches one or more other fluids where the fluids have different transport rates through or across the membrane. The fluids can be in the gas, vapor or liquid form (col. 7, lines 31-33).

16. With regard to claims 2, 5, and 7, and 33 **TRIMMER** discloses in the separation of oxygen from nitrogen a *pressure differential is between 5 psi and 250 psi*, and subjecting the permeate side to pressures between about 750 and 0.001 mm of mercury (col. 16, lines 13-19).

17. With regard to claim 3, **LYONS** teaches the pressure on the outside of the fiber tubes is maintained at 20-1000 milliBar higher than the pressure on the inside of the tubes (paragraph 78).
18. With regard to claim 4, **LYONS** discloses a vacuum system which draws air from the outside to the inside of the membrane is the preferred method of achieving the required differential pressure (paragraph 93).
19. With regard to claim 6, **TRIMMER** teaches a sweep fluid of preferably air (col. 15, lines 65-col. 16 lines 1-2); and the force which drives the permeating species across and through the membrane is a *pressure differential* between the feed side of the membrane and the permeate side of the membrane (col. 16, lines 3-7).
20. With regard to claim 8, 18, 20, and 22 **TRIMMER** teaches one or more other fluids where the fluids have different transport rates through or across the membrane. The fluids can be in the gas, vapor or liquid form (col. 7, lines 31-33).
21. With regard to claims 9 and 29, **LYONS** discloses a tubesheet comprising a thermoplastic polymeric material (col. 2, lines 63-64).
22. With regard to claims 10, 13, 30, and 36, **LYONS** discloses a modification technique that increases the number of pores (paragraph 19), and the modified fiber can have up to twice as many pores as conventional fiber (paragraph 20).
23. With regard to claims 11 and 34, **TRIMMER** teaches the use of polyethersulfone (col. 9, line 67).

24. With regard to claims 12 and 35, **LYONS** discloses the modification method primarily entails soaking the outer surface of the fiber tube with different liquids, followed by drying of the fiber tube (paragraph 57); the first stage is to soak the fiber in a mixture such as acetone (paragraph 64), the mixture is then displaced with distilled water (paragraph 66), the water is then dried from the fiber tube (paragraph 67).
25. With regard to claim 14, 15, 37, and 38, **LYONS** teaches the modification technique allows a very thin, uniform, defect free coating of selective polydimethylsiloxane material (paragraph 21).
26. With regard to claim 16, **LYONS** discloses the gas selectivity properties of the membranes can be improved even further by subjecting the coated surface of the membranes to a plasma discharge treatment technique (paragraph 85).
27. Regarding claim 17 and 40, **LYONS** teaches coated hollow fibers are placed between two cooled copper electrodes in a plasma chamber, the chamber can contains nitrogen, oxygen, argon, helium or mixtures of such gases; a typical voltage of 500 volts electrodes produce a plasma discharge (paragraphs 86 and 87).
28. Regarding claims 19, 43, and 44, **LYONS** discloses the rententate nitrogen air is gradually displaced out of chamber 35 through exit port 39 by fresh air that is continually being blown by fan 44 (paragraph 105). The control panel 55 would control the supply of electricity to the fan in module 47 and to the vacuum pump

**49**, control the vacuum and the flux produced by vacuum pump **49** (paragraph 149, figure 8).

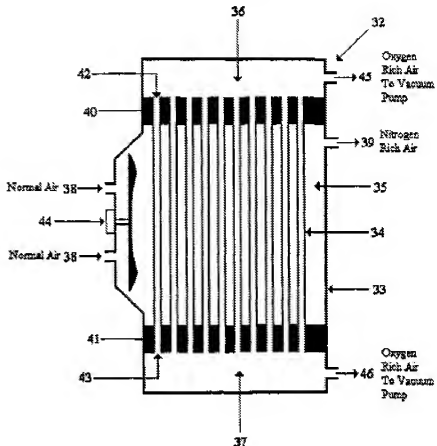


३. **संस्कृत**

29. Regarding claims 21, 45, and 46, LYONS teaches a vacuum pump continually evacuates the enriched oxygen air from chambers **36** and **37** and transfers the oxygen rich air (paragraph 104, figure 7).



Figure 7



30. Regarding claim 23, 47 and 48, **LYONS** discloses regulating valve 50 can allow normal atmospheric air to be mixed with the enriched oxygen air coming from module 47 (paragraph 146, figure 8).

31. Regarding claims 24, and 26 **LYONS** teaches the claimed invention except for air with slightly increased oxygen content of between, for example, 2% and 7% above normal (paragraph 126). It would have been obvious to one having ordinary skill in the art at the time the invention was made to have the nitrogen

enriched air comprising less than 10% oxygen and/or 7% oxygen and 93% nitrogen, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

32. Regarding claim 27 and 49, **LYONS** discloses that research has shown the efficiency of most combustion processes include engines (paragraph 166).
33. Regarding claim 41, **LYONS** teaches the casing **33** and the gas separation module **32** containing membranes can be manufactured from relatively lightweight materials, such as for example lightweight metals, rigid plastics, or combinations of such materials (paragraphs 95 and 96).
34. Regarding claim 50, **LYONS** discloses enclosed space **52** that requires an enhanced oxygen atmosphere through vent **53** (paragraph 147). **TRIMMER** also teaches one or more fluids where the fluids have different rates through or across the membrane; the fluids can be in the gas, vapor or liquid form. The mixture of gases to be separated preferably comprises *oxygen and nitrogen* (col. 7, lines 31-38).

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KARLA HAWKINS whose telephone number is (571) 270-5562. The examiner can normally be reached on Monday-Thursday 7:30- 5, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Duane Smith can be reached on 571-272-1166. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/DUANE SMITH/  
Supervisory Patent Examiner, Art Unit 1797

Karla Hawkins  
Examiner  
Art Unit 1797